Non-CO_2 Greenhouse Gases: Black Carbon

Source/Sectors: Mobile Sources

Technology: Options to reduce black carbon emission from mobile sources (D.1)

Description of the Technology:
Mobile sources, especially those associate with diesel, are responsible for most of the BC emissions, most technological options for BC emission reduction found from the literature search are for diesel vehicles and engines. Basically, BC is removed in the process that is mainly aimed for removal of particulate matter. Specific technological options to reduce BC emissions from mobile sources include:

- Diesel particle filters (DPFs) – DPFs remove PM from the diesel exhaust through physical filtration. DPFs must be supplemented with means of self-cleaning (regeneration) to remove the collected carbon and organic particles. This is done by adding heat to the exhaust, raising temperature high enough to oxidize carbon to gaseous carbon dioxide. Nonetheless, all DPFs still require periodic maintenance to clean-out ash that accumulates from the non-organic carbon components of the engine oil (Clean Air Task Force, 2005).
- Catalyst-based DPFs – The added catalyst effectively lowers the temperature required for regeneration of the filters. The catalyst can be poisoned by sulfur; therefore, this type of DPFs can only be used with diesel fuel of low sulfur content (Clean Air Task Force, 2005).
- Diesel oxidation catalysts (DOCs) – DOCs use the same type of catalyst material as that in the catalyst-based DPFs, but applied to a flow-through monolith, without the physical filter (Clean Air Task Force, 2005; Lyons, 2003). This is mainly for reduction of OC-based particulate matter and their removal efficiencies for BC should be relatively low.
- Closed crankcase emissions filtration device – A closed crankcase filtration device, by rerouting crankcase ventilation back to the engine, can be fitted to school buses and eliminate these emissions (Clean Air Task Force, 2005).
- Alternatives to diesel – It has been demonstrated that using biodiesel can reduce emissions of particulate matter (Clean Air Task Force, 2005; Lyons, 2003).
- Engine modifications – Particulates emissions can also be reduced through improvements to the basic engine such as turbo-charging, after-cooling, high-pressure fuel injection, retarding injection timing, and optimizing combustion chamber design (Lyons, 2003).
- Proper maintenance of diesel engines
- Reduce idling of diesel engines
- Replace gas lawn mowers with electrical mowers
- Reduce fuel consumption
- Reduce vehicle use

Effectiveness: Varies

Implementability: Varies

Reliability: Varies

Maturity: Varies

Environmental Benefits: Black carbon emission reduction

Cost Effectiveness: Varies

Industry Acceptance Level: Varies

Limitations: Varies

Sources of Information:

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13. U.S. Environmental Protection Agency (2006) "Regulatory Impact Analyses - 2006 National Ambient Air Quality Standards for Particle Pollution", United States Environmental Protection Agency, October 6, 2006.